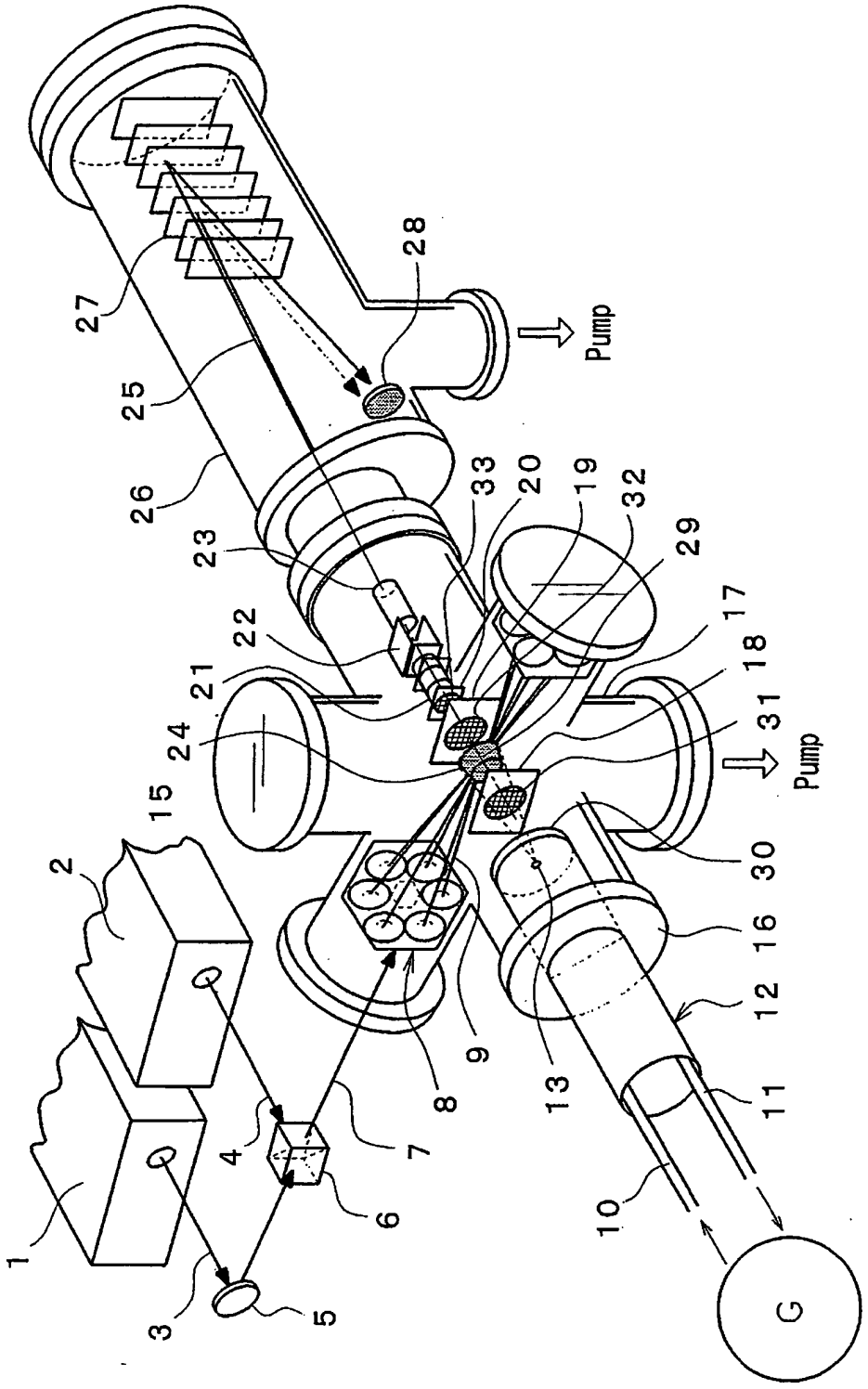
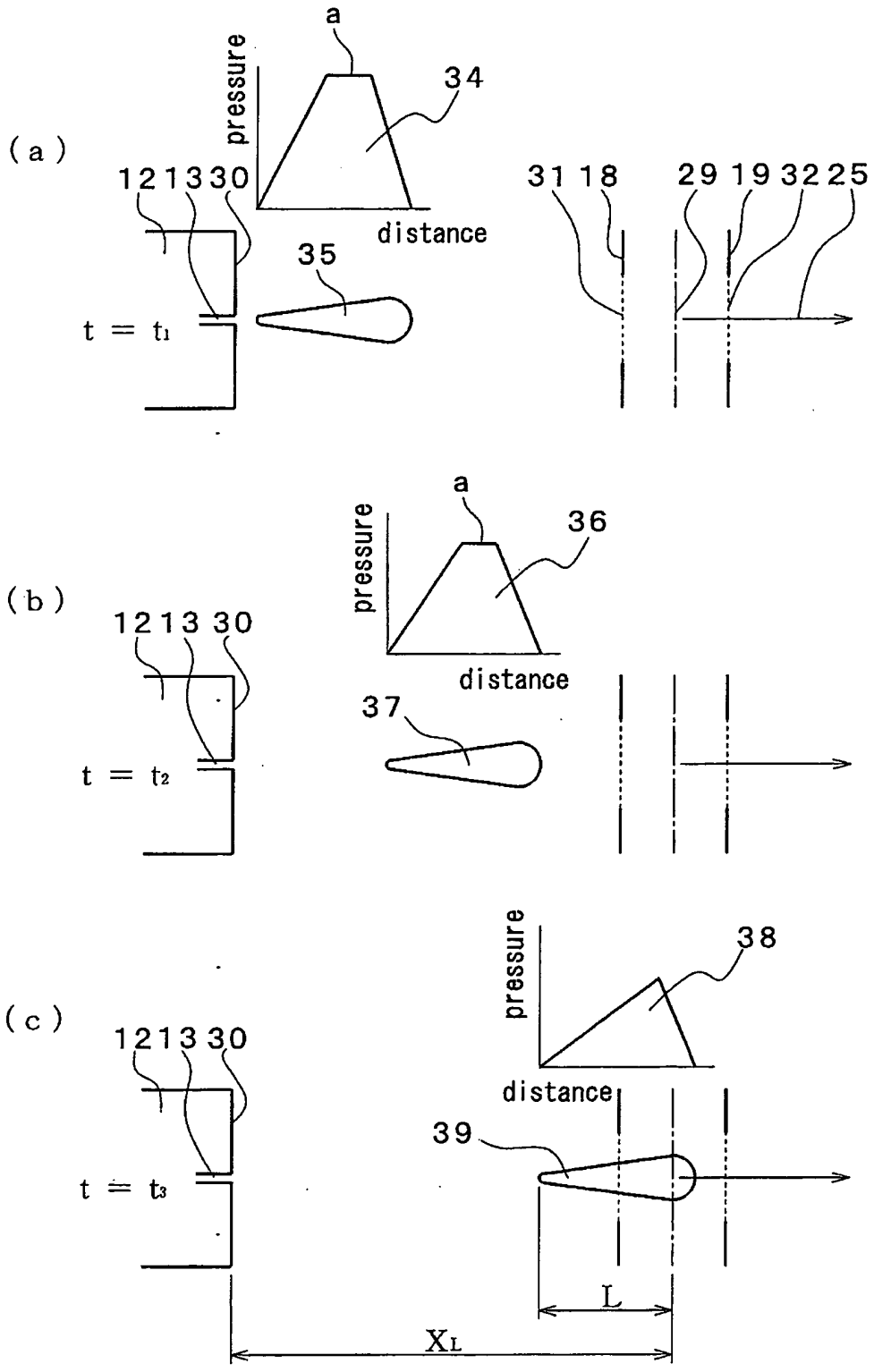
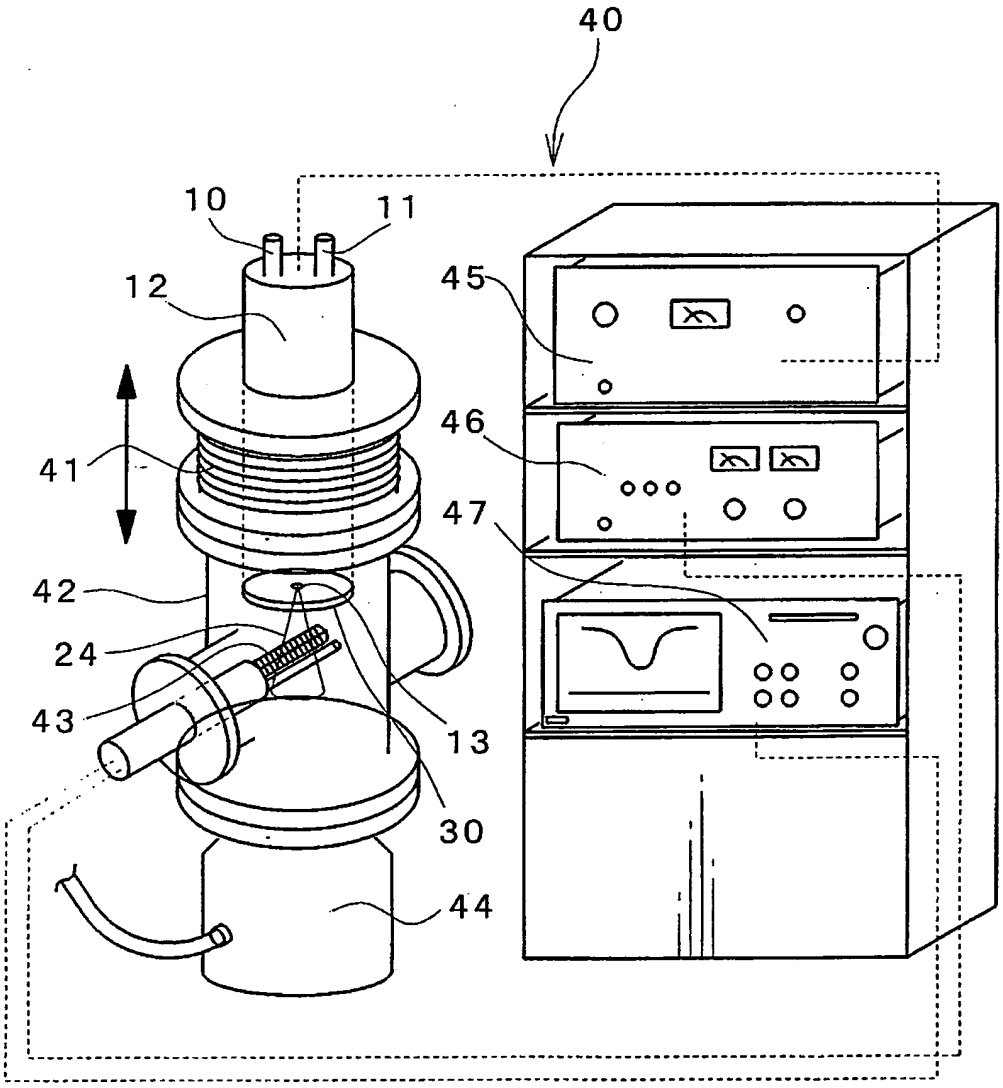
【Fig. 1】



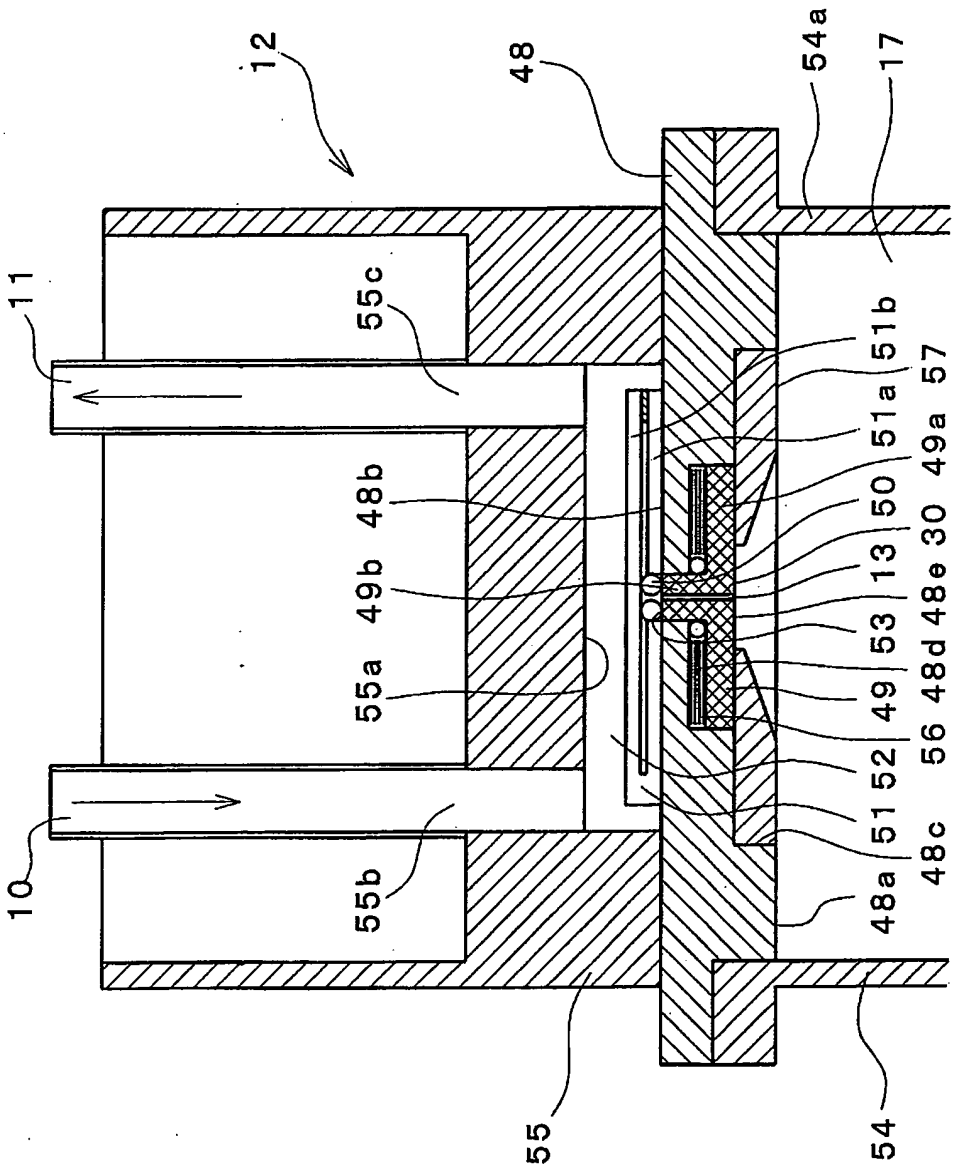
【Fig. 2】


(a)
a
pressure
34
distance
12 13 30
35
t = t1
31 18
29 19 32 25
(b)
a
pressure
36
distance
12 13 30
37
t = t2
(c)
pressure
38
distance
12 13 30
39
t = t3
L
XL

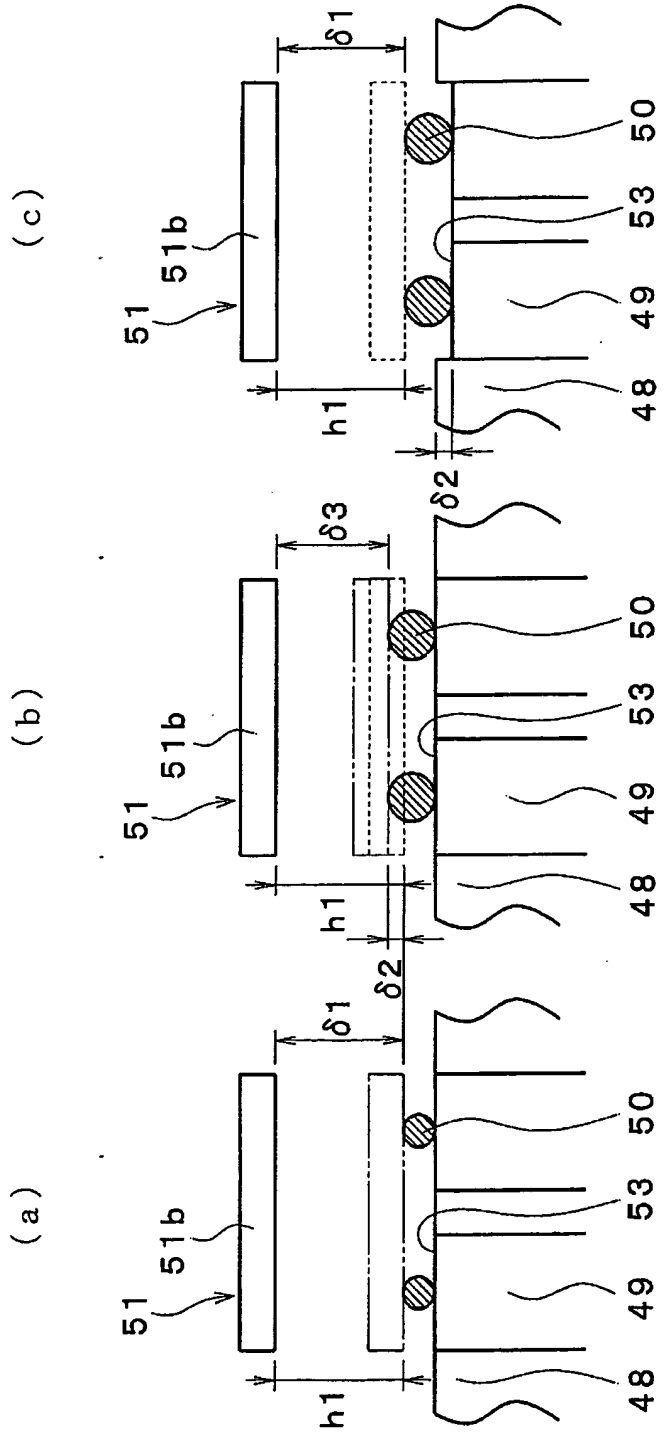
【Fig. 3】



【Fig. 4】

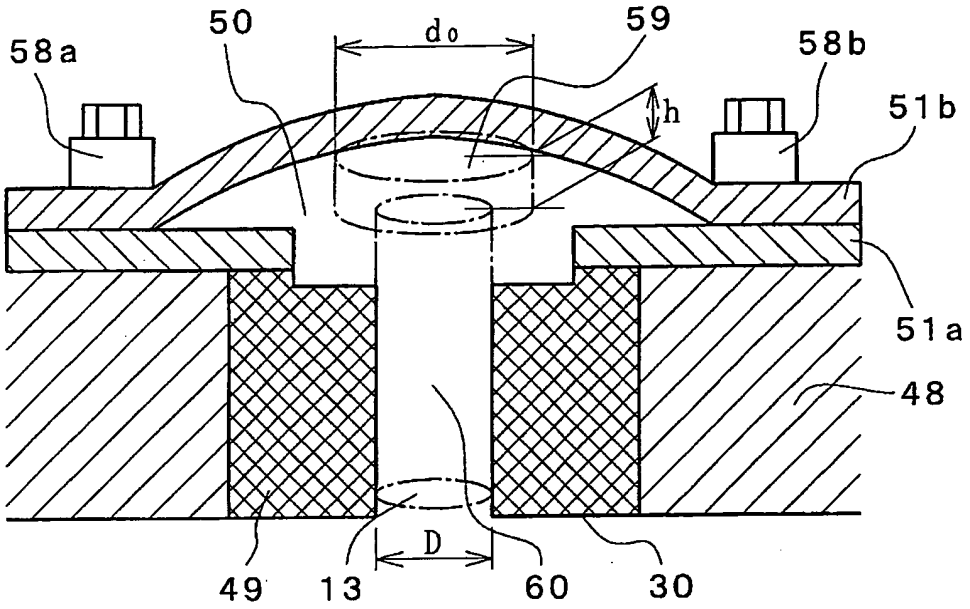

12
48
54a
17
11
55c
51b
51a
57
49a
48b
50
30
49b
13
48e
53
55a
48d
49
56
52
51
48c
10
55b
48a
55
54

【Fig. 5】

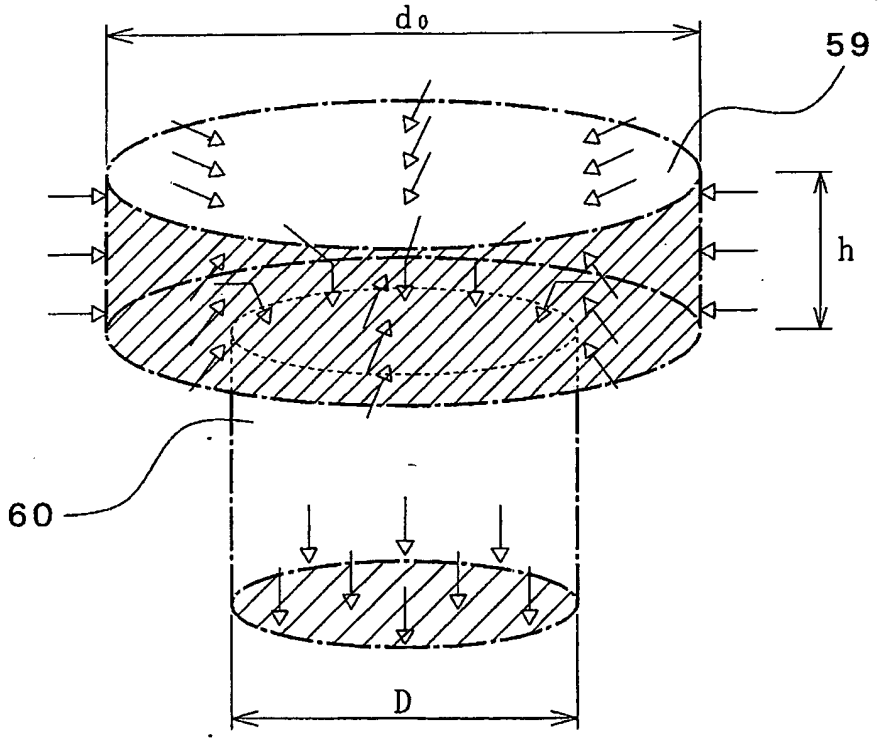


【Fig.6】

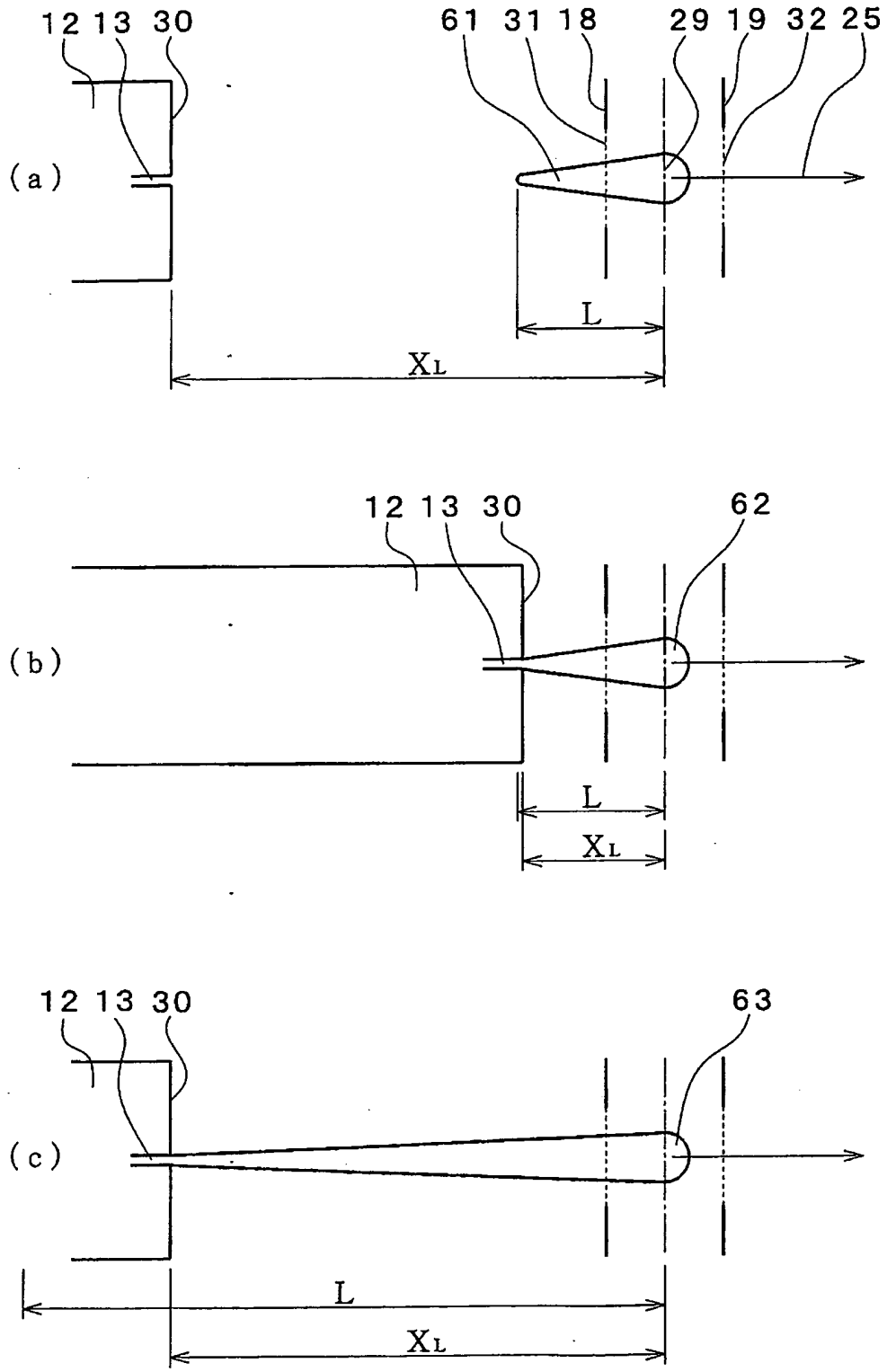
(a)



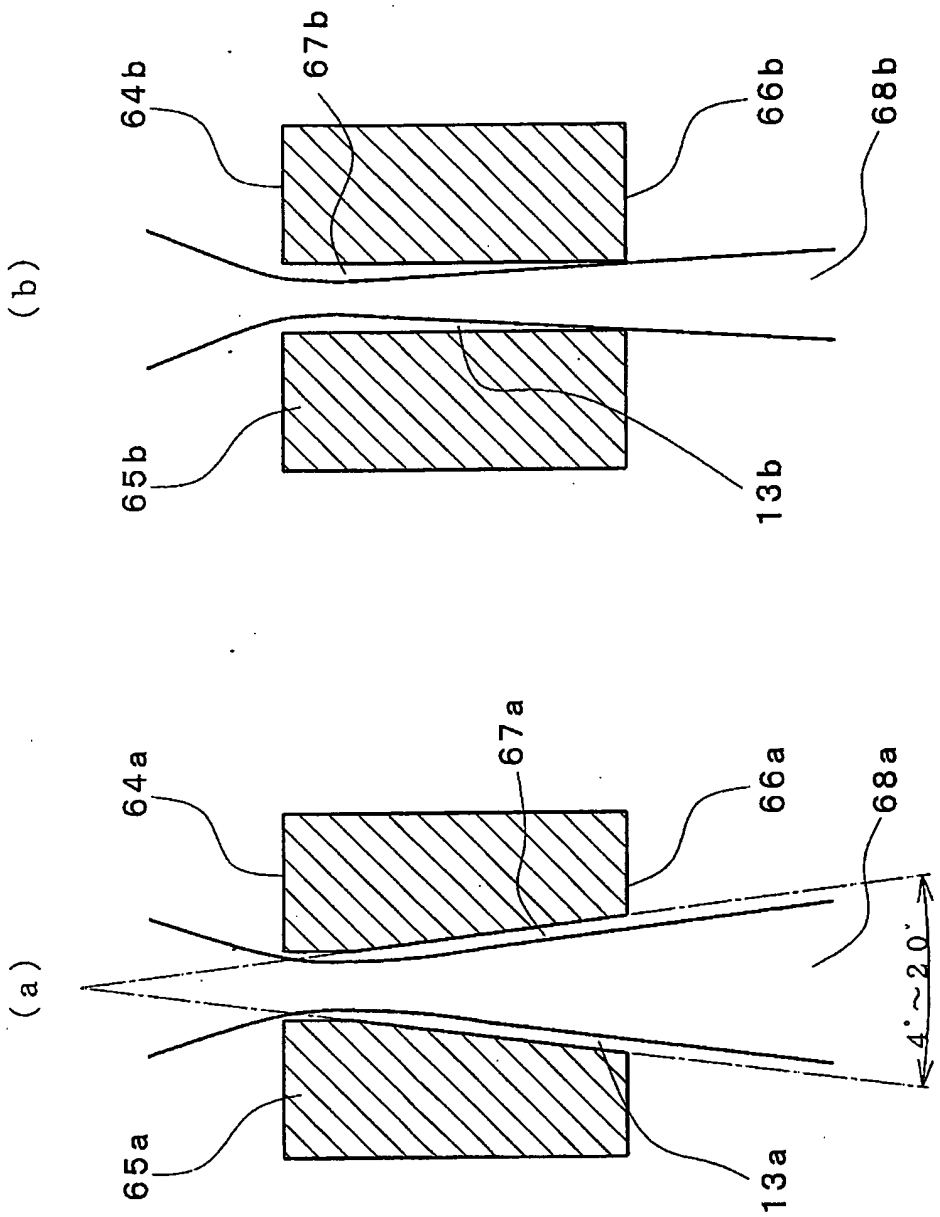
(b)



【Fig. 7】

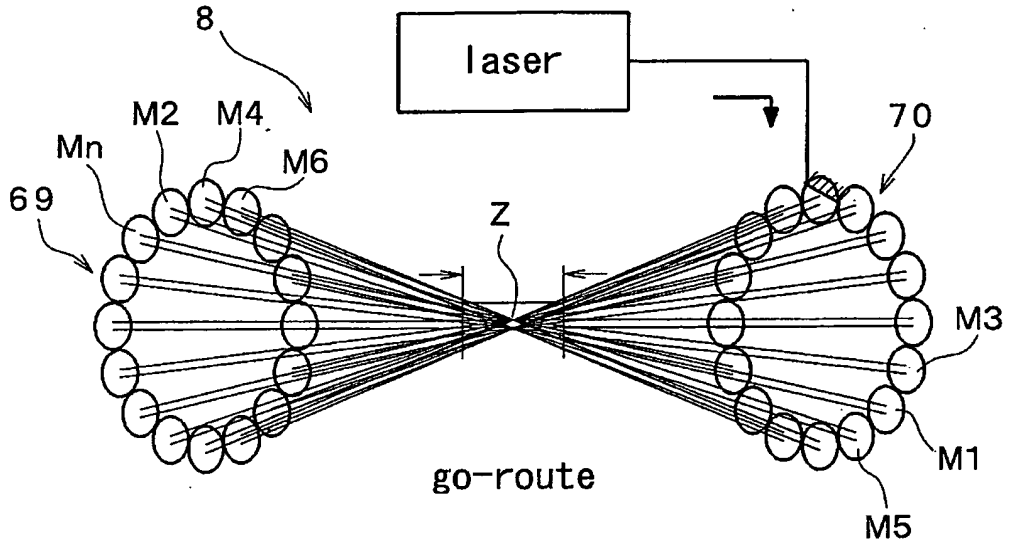


【Fig. 8】

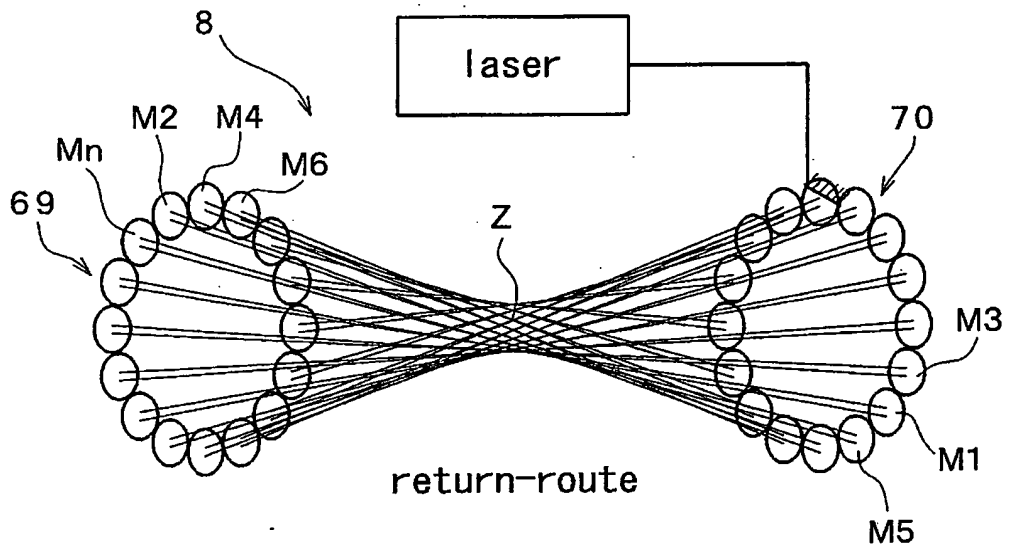


【Fig. 9】

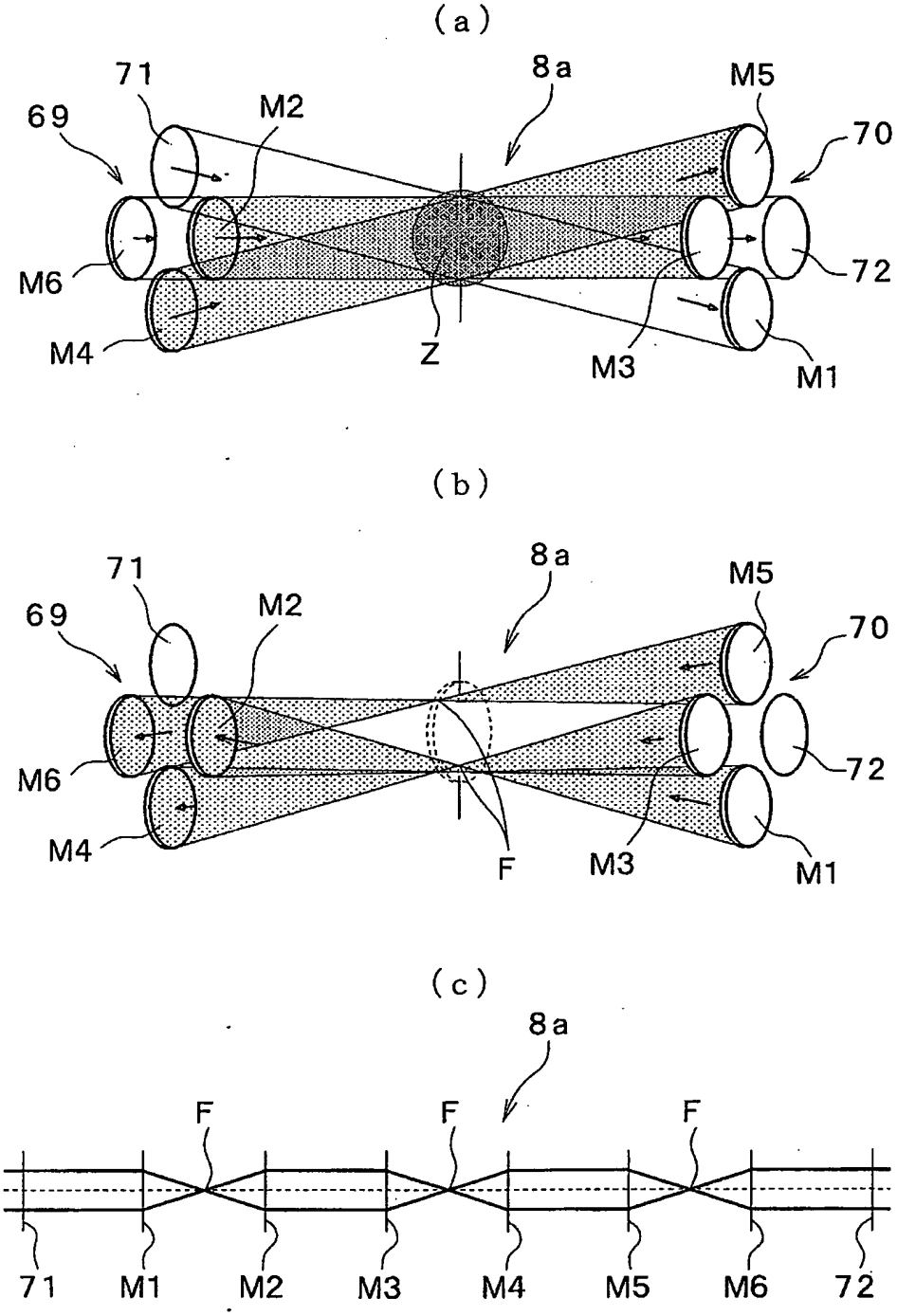
(a)


8
laser
M2
M4
Mn
M6
69
Z
70
M3
M1
M5
go-route

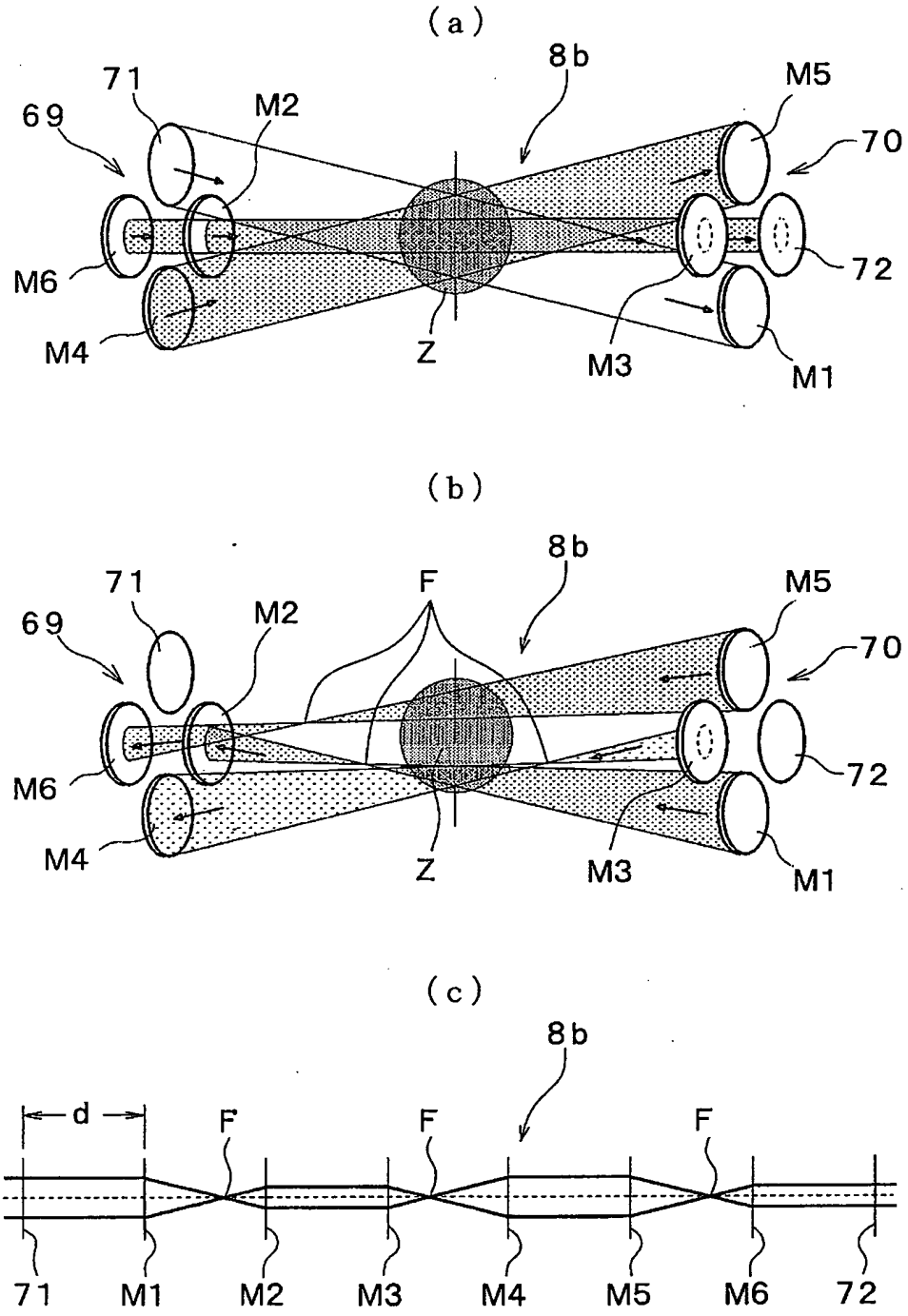
(b)


8
laser
M2
M4
Mn
M6
69
Z
70
M3
M1
M5
return-route

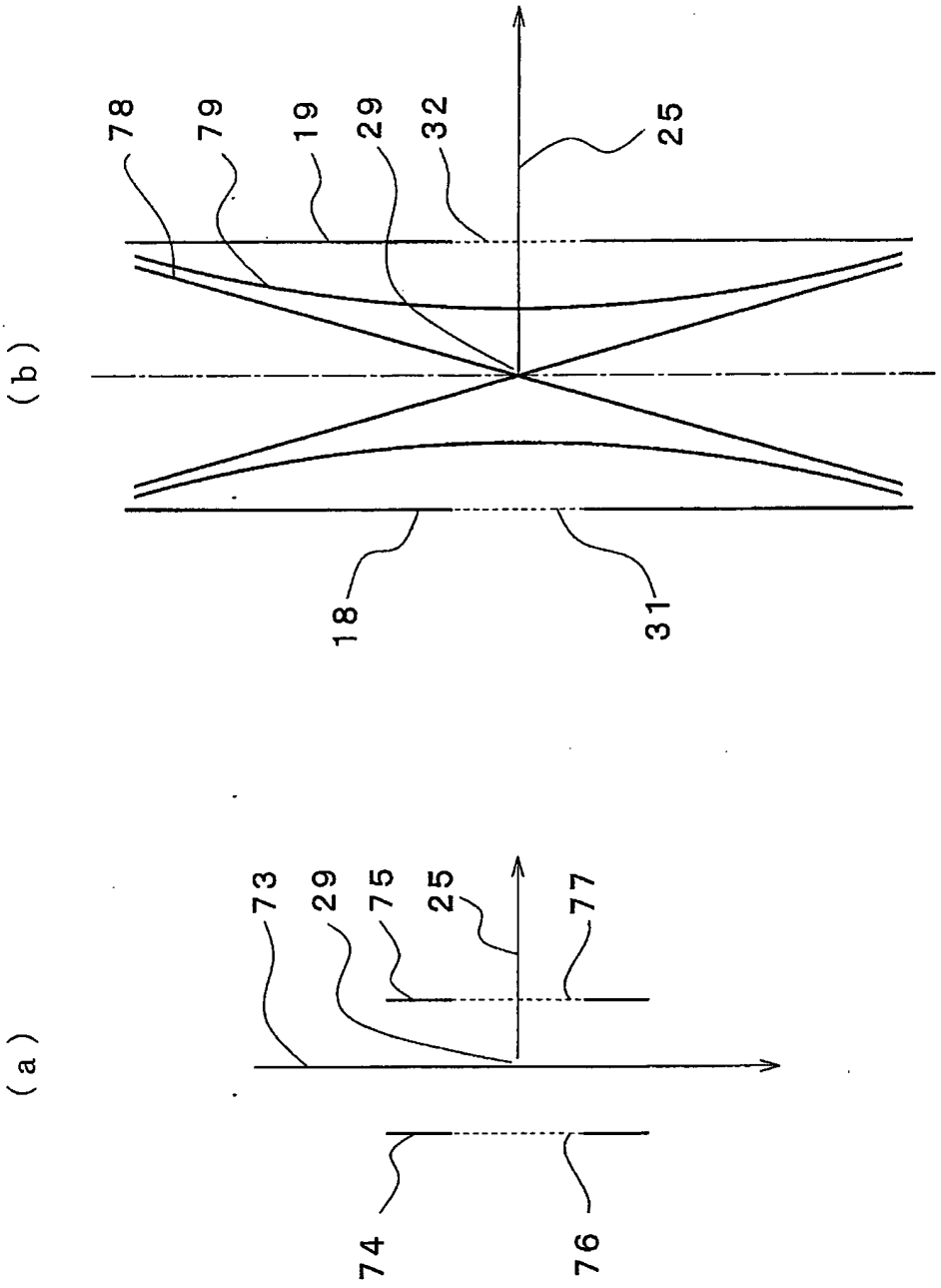
【Fig. 10】


(a)
71
8a
M5
69
M2
70
M6
72
M4
Z
M3
M1
(b)
71
8a
M5
69
M2
70
M6
72
M4
F
M3
M1
(c)
8a
F
F
F
71
M1
M2
M3
M4
M5
M6
72

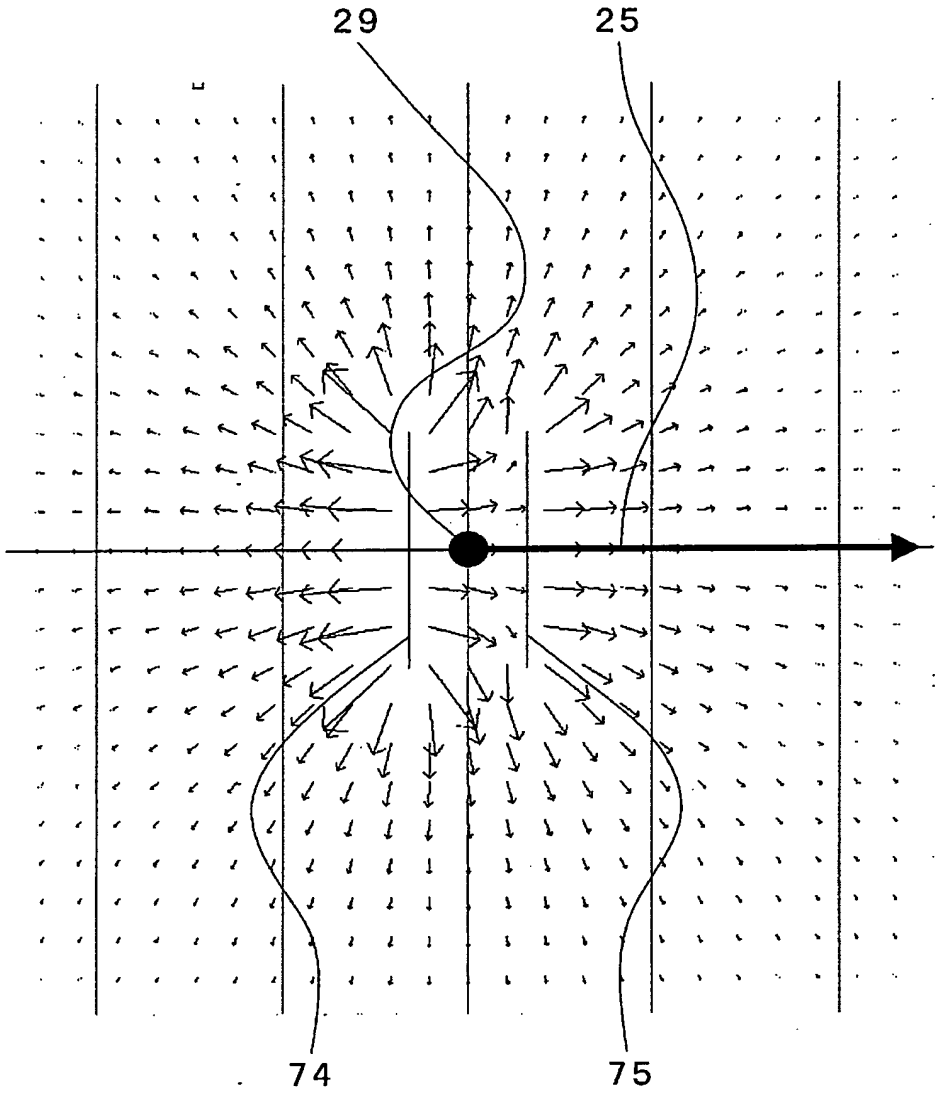
【Fig. 11】


(a)
71
69
M2
8b
M5
70
72
M6
M4
Z
M3
M1
(b)
71
69
M2
F
8b
M5
70
72
M6
M4
Z
M3
M1
(c)
8b
d
F
F
F
71
M1
M2
M3
M4
M5
M6
72

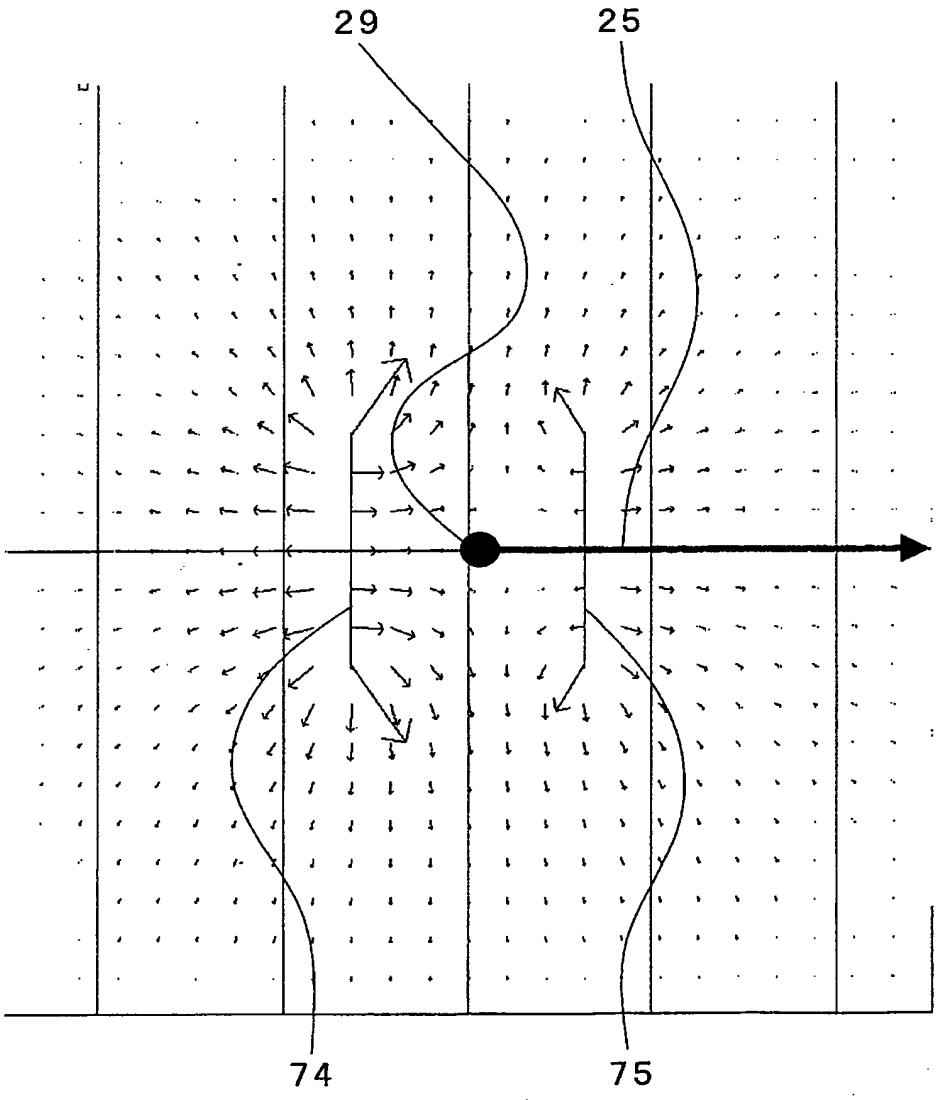
【Fig. 12】



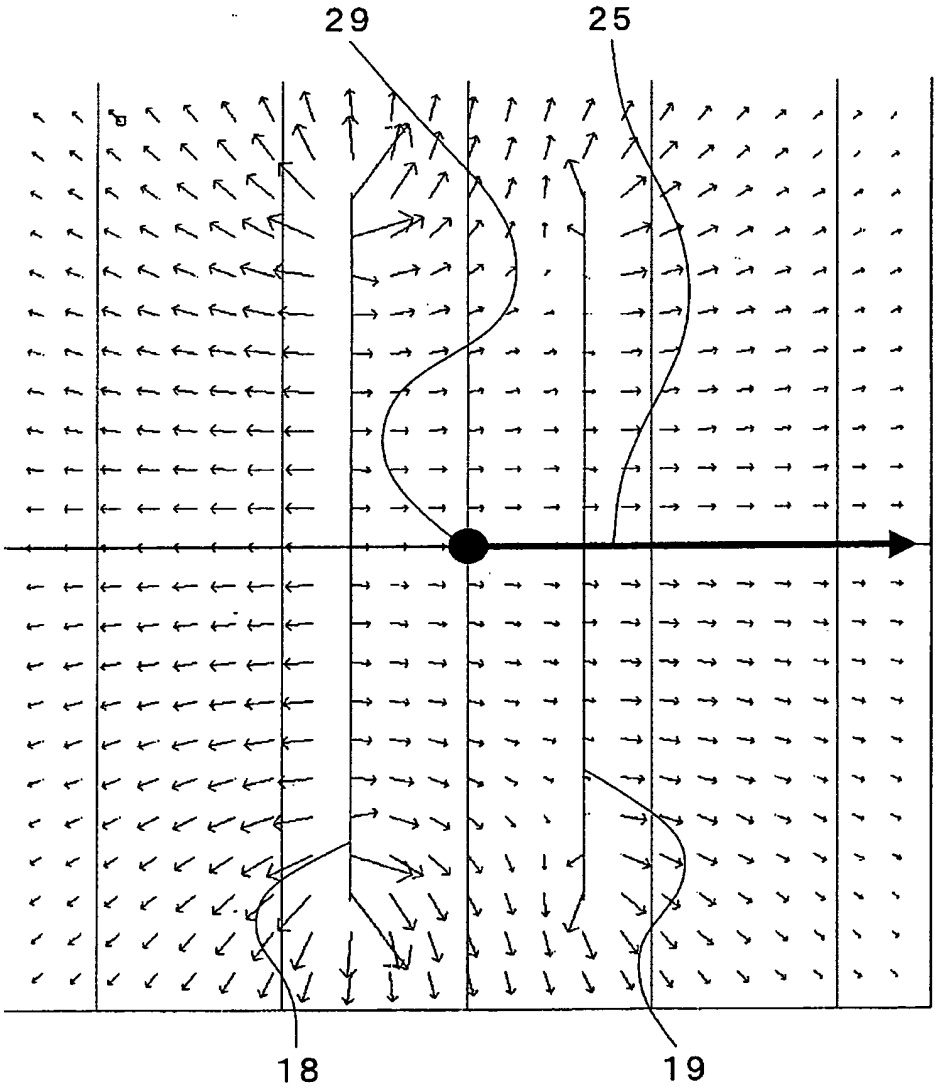
【Fig. 13】



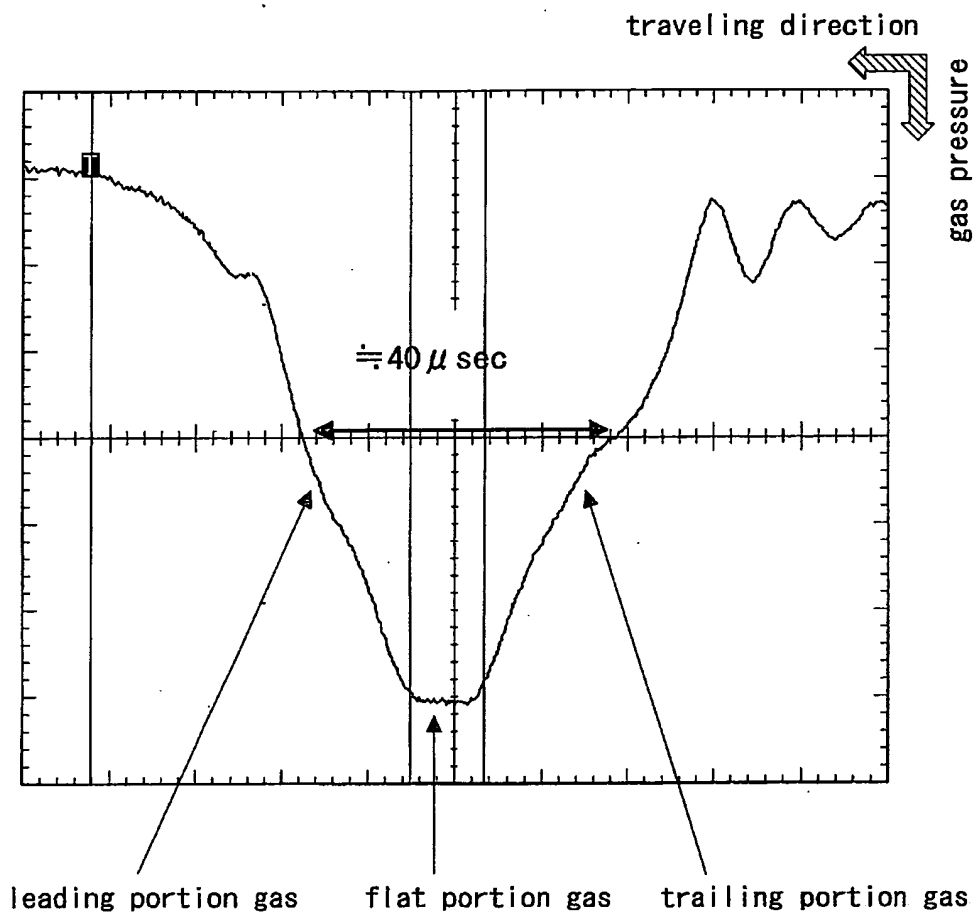
【Fig. 14】



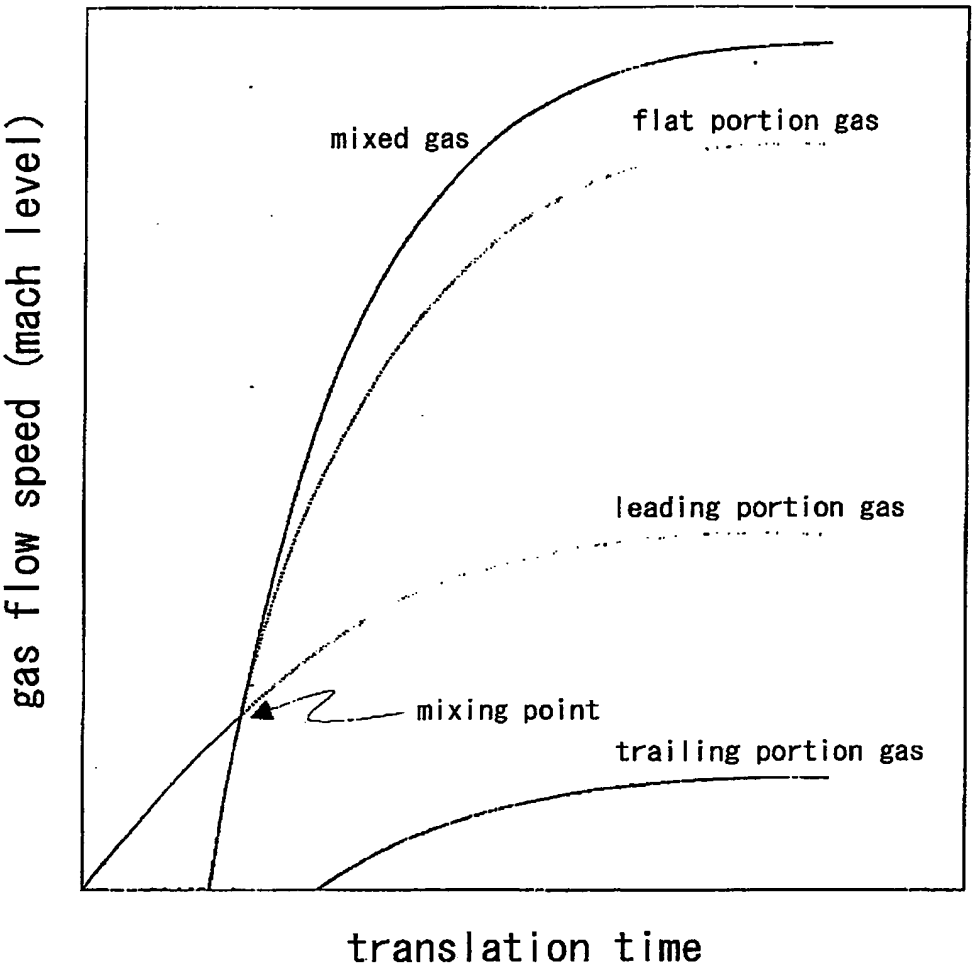
【Fig. 15】



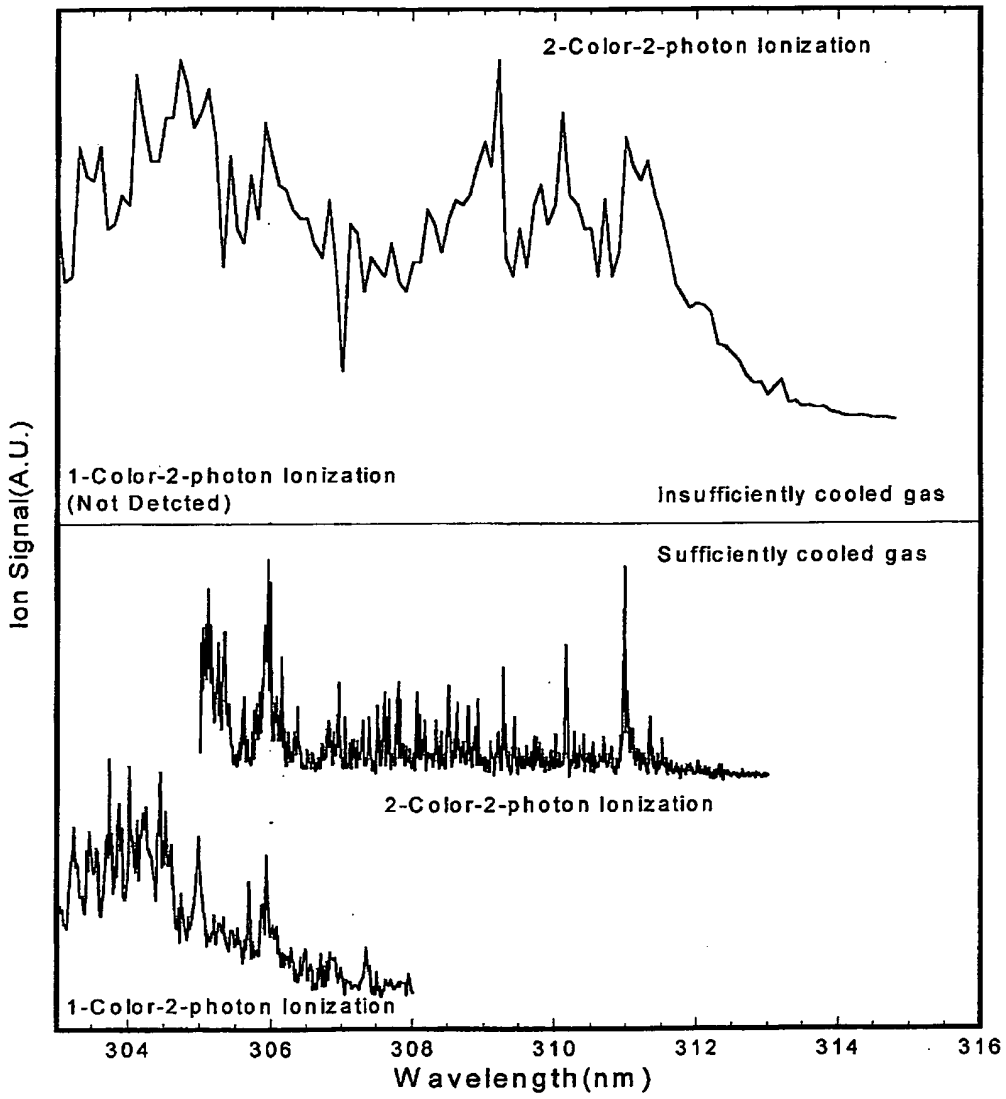
【Fig. 16】


traveling direction
gas pressure
≒40 μ sec
leading portion gas
flat portion gas
trailing portion gas

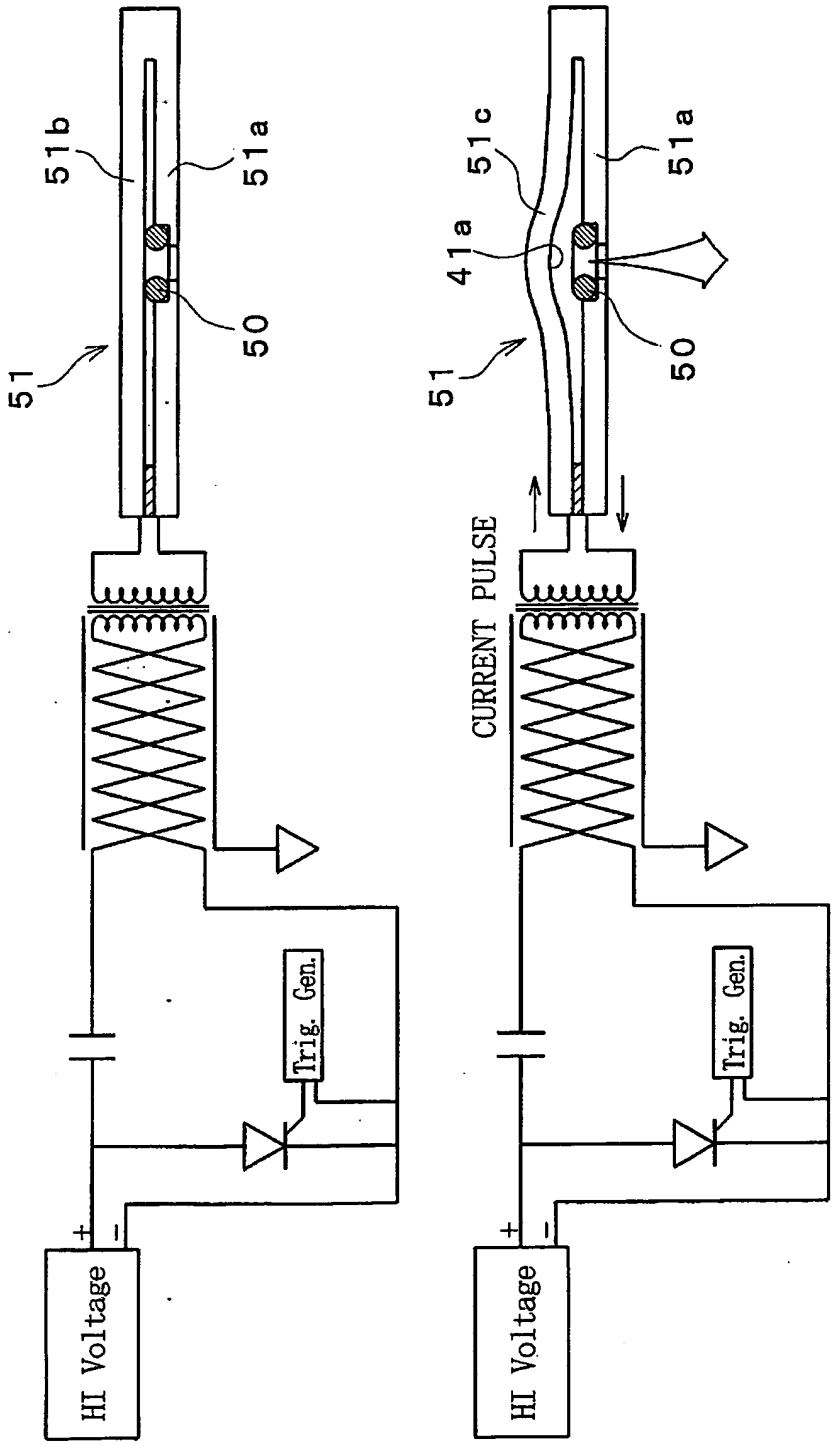
【Fig. 17】


gas flow speed (mach level)
mixed gas
flat portion gas
leading portion gas
mixing point
trailing portion gas
translation time

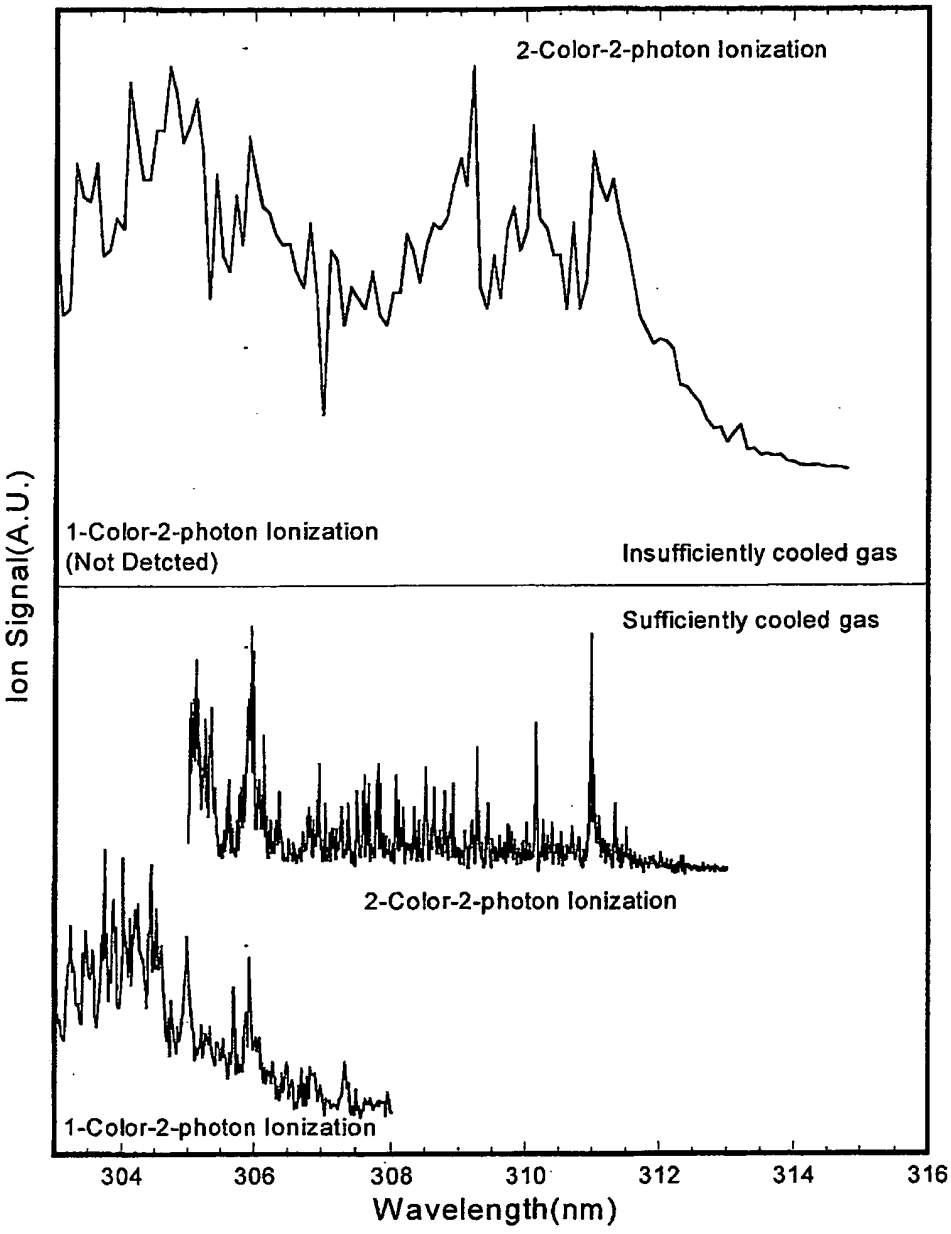
【Fig. 18】


2-Color-2-photon Ionization
1-Color-2-photon Ionization
(Not Detcted)
Insufficiently cooled gas
Sufficiently cooled gas
2-Color-2-photon Ionization
1-Color-2-photon Ionization
Ion Signal(A.U.)
304
306
308
310
312
314
316
Wavelength(nm)

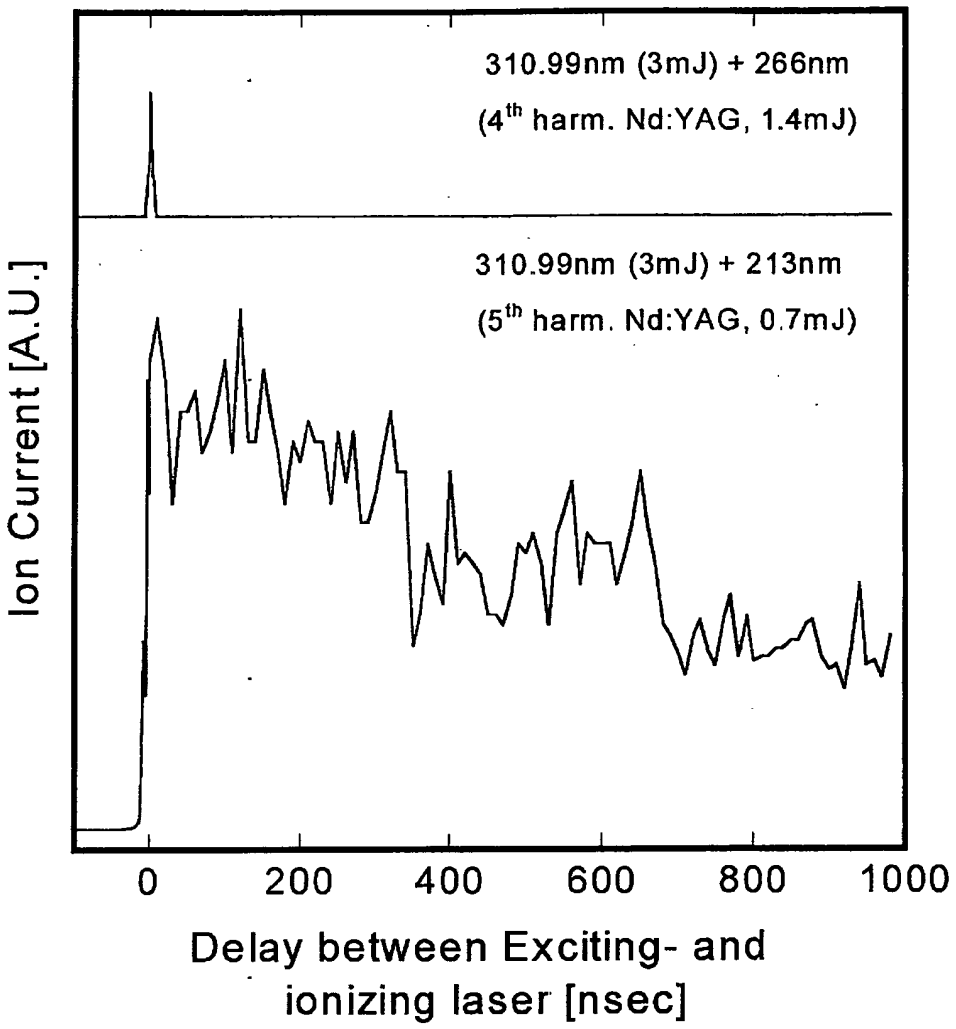
【Fig. 19】



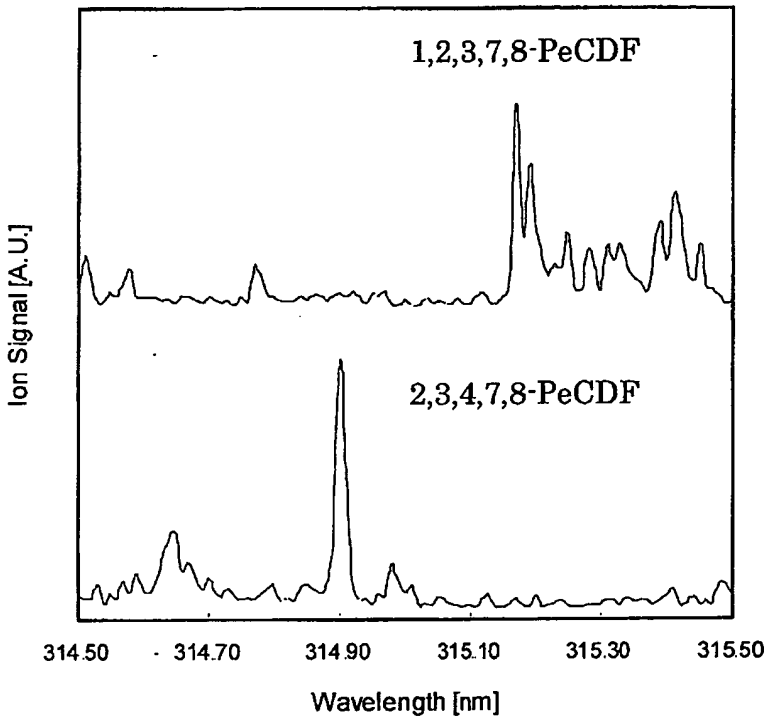
【Fig. 20】

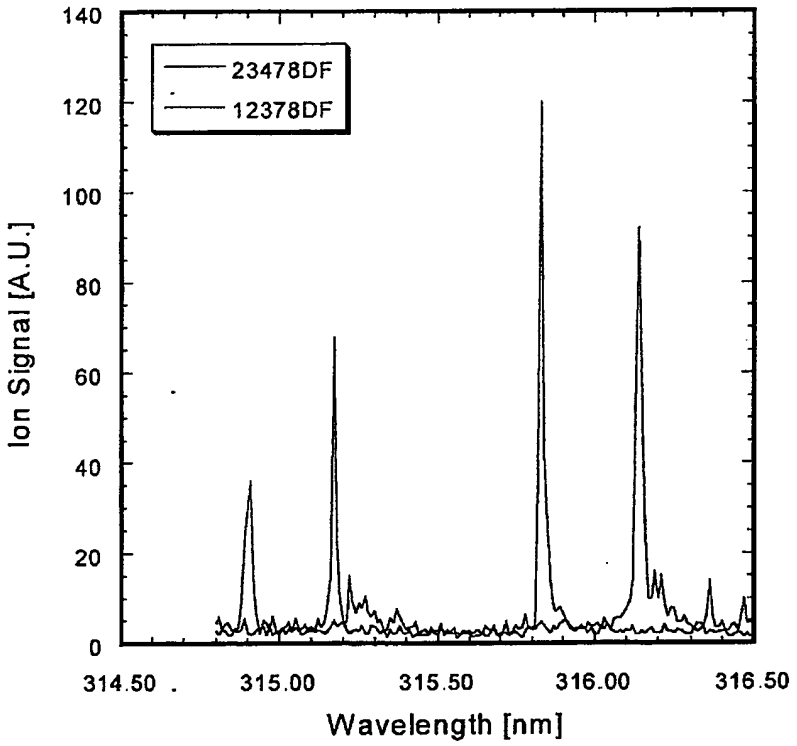

2-Color-2-photon Ionization
1-Color-2-photon Ionization
(Not Detcted)
Insufficiently cooled gas
Sufficiently cooled gas
2-Color-2-photon Ionization
1-Color-2-photon Ionization
Ion Signal(A.U.)
304
306
308
310
312
314
316
Wavelength(nm)

【Fig. 21】

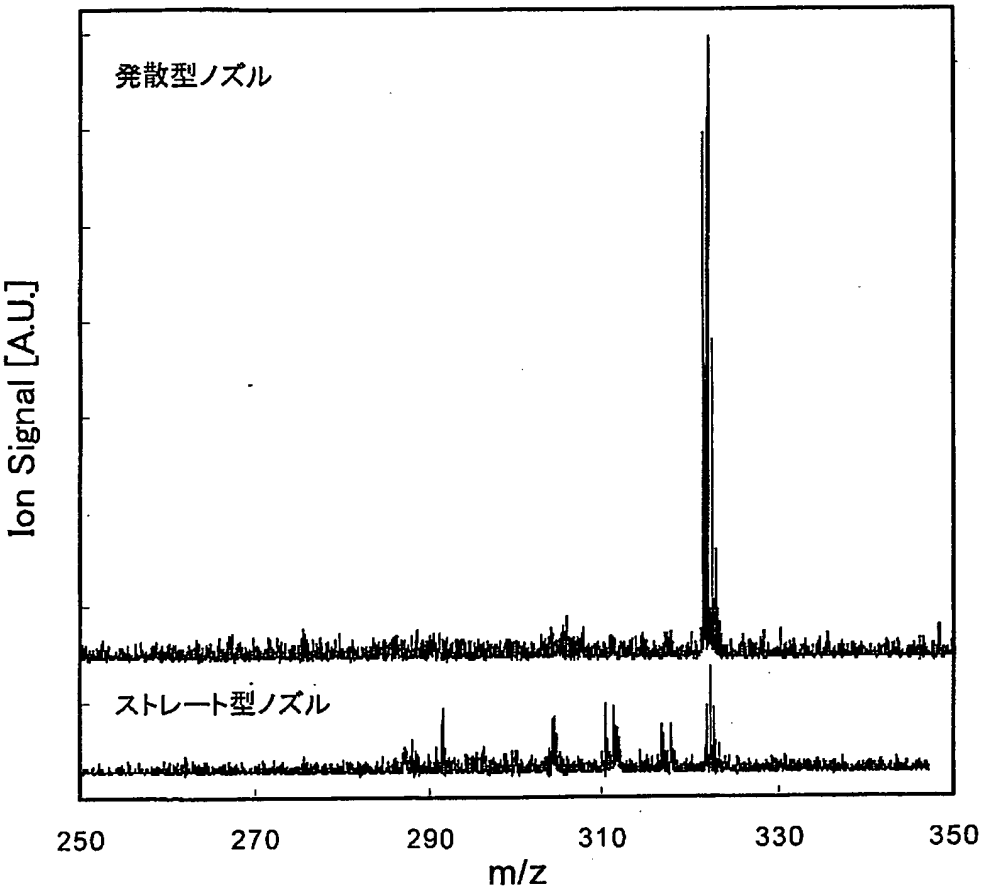
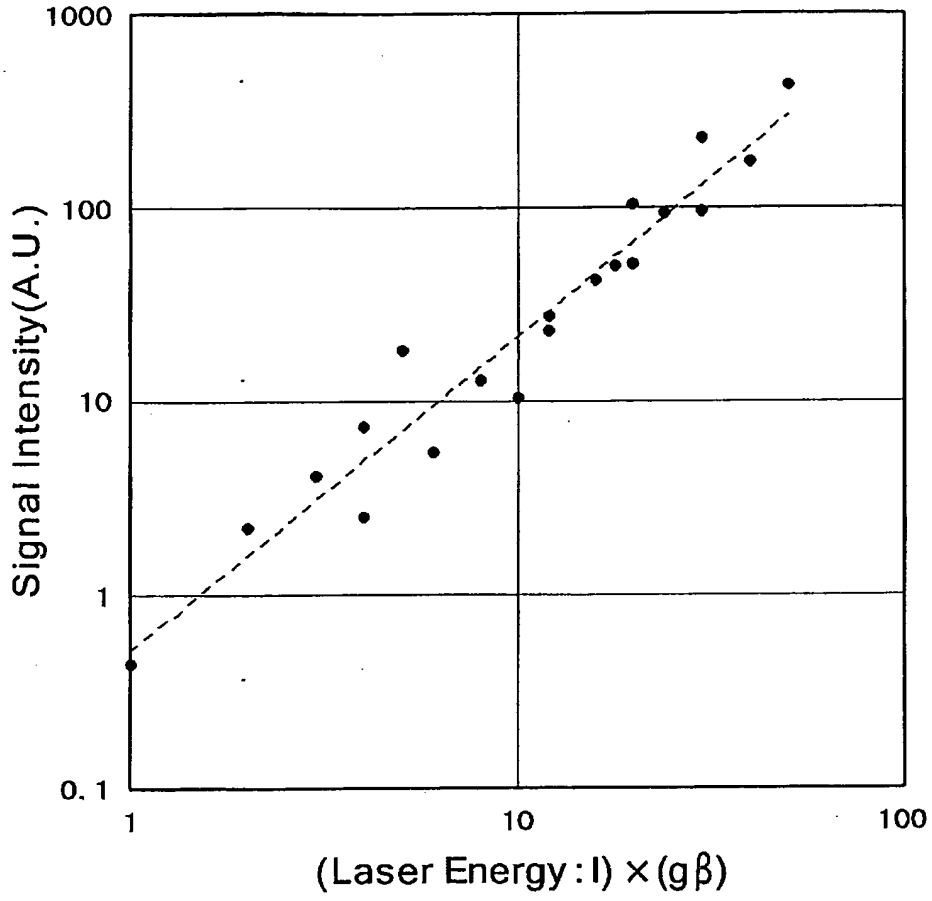

310.99nm (3mJ) + 266nm
(4th harm. Nd:YAG, 1.4mJ)
310.99nm (3mJ) + 213nm
(5th harm. Nd:YAG, 0.7mJ)
Ion Current [A.U.]
0
200
400
600
800
1000
Delay between Exciting- and
ionizing laser [nsec]

【Fig. 22】


1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
Ion Signal [A.U.]
314.50
314.70
314.90
315.10
315.30
315.50
Wavelength [nm]


23478DF
12378DF
Ion Signal [A.U.]
0
20
40
60
80
100
120
140
314.50
315.00
315.50
316.00
316.50
Wavelength [nm]

【Fig. 23】



【Fig. 24】